

IN THE CLAIMS

1 1. [previously amended] A method for handling dynamic state information used for
2 handling data packets, which arrive at a network element node of a network element cluster,
3 said network element cluster having at least two nodes and each node handling separate sets
4 of data packets, said method comprising:

5 - maintaining in a first node a first, node-specific data structure comprising
6 entries representing state information needed for handling sets of data packets
7 handled in said first node,

8 - maintaining in said first node in addition to said node-specific data structure a
9 second, common data structure comprising at least entries representing state
10 information for data packets handled in at least one other node of said network element
11 cluster, the contents of said common data structure effectively differing from the
12 contents of said node-specific data structure and including copies of all state
13 information entries maintained in a node-specific data structure of said at least one
14 other node and needed for handling sets of data packets in said at least one other
15 node, said entries being maintained according to information on how different sets of
16 data packets are distributed among the nodes of the network element cluster,

17 - dynamically changing distribution of at least one set of data packets from said
18 at least one other node to said first node the network element cluster, and providing
19 said first node with respective changed distribution information,

20 - in response to said changed distribution information, selecting the state
21 information entries of said at least one re-distributed set of data packets from said
22 second common data structure and transferring them to said first node-specific data
23 structure of said first node.

1 2. [previously amended] A method according to claim 1, further comprising:

2 - allocating to each node belonging to said network element cluster certain
3 node-specific distribution identifiers, each node having separate node-specific
4 distribution identifiers allocated to it,

5 - handling at least a plurality of data packets so that a data packet is handled in
6 that node of said network element cluster, to which node a distribution identifier

7 calculated using certain field(s) of said data packet is allocated, and
8 - maintaining in a plurality of entries of said node-specific and common data
9 structures distribution information relating to the distribution identifier, which
10 corresponds to the set of data packets related to the respective entry.

1 3. [previously amended] A method according to claim 2, further comprising:

2 - reallocating said distribution identifiers to the nodes of said network element
3 cluster,

4 - if said reallocation results in a new distribution identifier being allocated to a
5 node, said new distribution identifier being a distribution identifier not allocated to said
6 node at the time of the reallocation, identifying in the common data structure of said
7 node the entries corresponding to said new distribution identifier, and adding said
8 entries to the node-specific data structure of said node, and

9 - if said reallocation results in an old distribution identifier not being allocated to
10 a node anymore, said old distribution identifier being a distribution identifier allocated to
11 said node at the time of the reallocation, identifying in the node-specific data structure
12 of said node the entries corresponding to said old distribution identifier, and clearing
13 said entries from the node-specific data structure of said node.

1 4. [previously amended] A method according to claim 2, further comprising:

2 - adding a new entry to said node-specific data structure in a first node,
3 - communicating said new entry at least to a second node of the network
4 element cluster, and
5 - adding an entry corresponding to said new entry to the common data
6 structure of said second node.

1 5. [previously amended] A method according to claim 4, further comprising:

2 - adding an entry corresponding to said new entry to the common data
3 structure of said first node.

1 6. [previously amended] A method according to claim 1, further comprising maintaining
2 in said common data structure of said node entries representing state information needed for

3 handling sets of data packets handled in said node.

1 7. [previously amended] A method according to claim 1, wherein said state information
2 comprises the source address field and/or the destination address field of an Internet Protocol
3 header, and/or port header fields of a Transmission Control Protocol header and/or port
4 header fields of a User Datagram Protocol header, and/or the identifier header field of an
5 Internet Control Message Protocol header, and/or a Message Identifier field of an Internet
6 Security Association and Key Management Protocol header, and/or an Initiator Cookie field of
7 an Internet Security Association and Key Management Protocol header, and/or the Security
8 Parameter Index field of a security header relating to the IPSec protocol suite, and/or a Session
9 ID field relating to the Secure Sockets Layer protocol, and/or an HTTP Cookie field relating to
10 the HyperText Transfer Protocol.

1 8. [previously amended] A method according to claim 1, wherein said state
2 information comprises information-identifying an authenticated entity.

1 9. [previously amended] A method according to claim 1, wherein said state information
2 comprises information-identifying a secured tunnel, within which data packets of the
3 corresponding set are tunneled.

1 10. [previously amended] A method according to claim 2, wherein said distribution
2 identifier is a hash value and a hash function is used for calculating a hash value using certain
3 field(s) of a data packet.

1 11. [previously amended] A method according to claim 2, wherein said distribution
2 information is said distribution identifier.

1 12. [previously amended] A method according to claim 2, wherein said distribution
2 information is information needed for calculating said distribution identifier for the
3 corresponding data packet.

1 13. [previously amended] A method according to claim 2, wherein said certain field(s)

2 for calculating a distribution identifier comprise the source address field and/or the destination
3 address field of an Internet Protocol header, and/or port header fields of a Transmission
4 Control Protocol header and/or port header fields of a User Datagram Protocol header, and/or
5 the identifier header field of an Internet Control Message Protocol header, and/or a Message
6 Identifier field of an Internet Security Association and Key Management Protocol header,
7 and/or an Initiator Cookie field of an Internet Security Association and Key Management
8 Protocol header, and/or the Security Parameter Index field of a security header relating to the
9 IPSec protocol suite, and/or a Session ID field relating to the Secure Sockets Layer protocol,
10 and/or an HTTP Cookie field relating to the HyperText Transfer Protocol.

1 14. A network element node of a network element cluster having at least two
2 nodes, said node comprising
3 - first data storage,
4 - means maintaining in said first data storage a first, node-specific data
5 structure comprising entries representing state information needed for handling sets of
6 data packets handled in said node,
7 - second data storage, and
8 - means maintaining in said second data storage a second, common data
9 structure comprising at least entries representing state information for data packets
10 handled in one other node of said network element cluster, the contents of said
11 common data structure effectively differing from the contents of said node-specific
12 data structure and including copies of all state information entries maintained in a node-
13 specific data structure of said at least one other node and needed for handling sets of
14 data packets in said at least one other node, and said entries being maintained
15 according to information on how different sets of data packets are distributed among
16 the nodes of the network element cluster,
17 - means receiving changed distribution information dynamically changing
18 distribution of at least one set of data packets from said at least one other node to said
19 node in the network element cluster, and
20 - means that, based on said changed distribution information selects the state
21 information entries of said at least one re-distributed set of data packets from said
22 second common data structure in said second data storage and transfers them to said

23 first node-specific data structure in said first data storage of said node.

1 15. [previously amended] A network element node according to claim 14, -
2 wherein:

3 - said means maintaining the node-specific data structure are adapted to add a
4 new entry to said node-specific data structure in said first storage means, and to
5 communicate said new entry to said means for maintaining common data structure,

6 - said means for maintaining the common data structure are adapted to
7 communicate said new entry at least to one other node of the network element cluster,
8 and in that

9 - said means maintaining the common data structure are further adapted to
10 receive an entry from at least one other node of the network element cluster and to
11 add an entry corresponding to said received entry to said common data structure in
12 said second storage means.

1 16. [previously amended] A network element node according to claim 15, wherein:

2 - said means for maintaining the common data structure are further adapted to
3 add a new entry received from said means for maintaining the node-specific data
4 structure to said common data structure in said second storage means.

1 17. [previously amended] A network element node according to claim 14, further
2 comprising:

3 - means receiving distribution identifiers, which are currently allocated to said
4 node, said distribution identifiers being used for handling at least a plurality of data
5 packets so that a data packet is handled in that node of said network element cluster,
6 to which node a distribution identifier calculated using certain field(s) of said data
7 packet is allocated, and

8 - third data storage storing said distribution identifiers, and

9 - said means maintaining the node-specific and common data structures are
10 adapted to maintain in a plurality of entries of said node-specific and common data
11 structures in said first and second data storage distribution information relating to the
12 distribution identifier, which corresponds to the set of data packets related to the

1 3 respective entry.

1 18. [previously amended] A network element node according to claim 17, wherein:
2 - said means receiving distribution identifiers are adapted to receive reallocated
3 distribution identifiers,
4 - said means maintaining the common data structure are adapted to detect a
5 new distribution identifier being allocated to said node due to the reallocation, said new
6 distribution identifier being a distribution identifier not allocated to said node at the time
7 of receiving reallocated distribution identifiers, and to identify in the common data
8 structure the entries corresponding to said new distribution identifier, and to
9 communicate said entries to said means for maintaining the node-specific data
10 structure for said entries to be added to the node-specific data structure, and
11 - said means maintaining the node-specific data structure are adapted to detect
12 an old distribution identifier not being anymore allocated to said node due to the
13 reallocation, said old distribution identifier being a distribution identifier allocated to said
14 node at the time of the reallocation, and to identify in the node-specific data structure
15 the entries corresponding to said old distribution identifier, and to clear said entries
16 from the node-specific data structure.

1 19. [previously amended] A network element node according to claim 14, wherein said
2 first data storage is a portion of kernel space memory.

1 20. [previously amended] A network element node according to claim 14, wherein said
2 second data storage means is a portion of user space memory.

1 21. [previously amended] A network element node according to claim 14, wherein said
2 first data storage is a portion of content addressable memory.

1 22. [previously amended] A network element node according to claim 14, wherein said
2 first storage means is a part of a cryptographic card.

1 23. [previously amended] A network element cluster having at least two network

2 element nodes, at least one of said nodes comprising

3 - first data storage means,

4 - means for maintaining in said first storage means a first, node-specific data
5 structure comprising entries representing state information needed for handling sets of
6 data packets handled in said node,

7 - second data storage means, and

8 - means maintaining in said second storage a second, common data structure
9 comprising at least entries representing state information needed for handling sets of
10 data packets handled in one other node of said network element cluster, the contents
11 of said common data structure effectively differing from the contents of said node-
12 specific data structure, and including copies of all state information entries maintained
13 in a node-specific data structure of said one other node and needed for handling sets
14 of data packets in said one other node, said entries being maintained according to
15 information on how different sets of data packets are distributed among the nodes of
16 the network element cluster,

17 - means for receiving changed distribution information dynamically changing
18 distribution of at least one set of data packets from said one other node to said at least
19 one node in the network element cluster, and

20 - means that based on said changed distribution information selects the state
21 information entries of said at least one re-distributed set of data packets from said
22 second common data structure in said second data storage and transferring them to
23 said first node-specific data structure in said first data storage means of said at least
24 one node.

1 24. [previously amended] A network element cluster -according to claim 23, -
2 further comprising:

3 - means allocating to each node belonging to said network element cluster
4 certain node-specific distribution identifiers, each node having separate node-specific
5 distribution identifiers allocated to it, said distribution identifiers being used for handling
6 at least a plurality of data packets so that a data packet is handled in that node of said
7 network element cluster, to which node a distribution identifier calculated using certain
8 field(s) of said data packet is allocated, and in that said at least one node further

comprises:

- means receiving distribution identifiers, which are currently allocated to said node, and
- third data storage storing said distribution identifiers, and
- said means for maintaining the node-specific and common data structures are adapted to maintain in a plurality of entries of said node-specific and common data structures in said first and second data storage means distribution information relating to the distribution identifier, which corresponds to the set of data packets related to the respective entry.

25. [currently amended] A network element cluster according to claim 24, wherein:

- said means for allocating distribution identifiers are adapted to reallocate distribution identifiers to the nodes of said network element cluster, and wherein in said at least one node
- said means for receiving distribution identifiers are adapted to receive reallocated distribution identifiers, and
- said means for maintaining the common data structure are adapted to detect a new distribution identifier being allocated to said node due to the reallocation, said new distribution identifier being a distribution identifier not allocated to said node at the time of receiving reallocated distribution identifiers, and to identify in the common data structure the entries corresponding to said new distribution identifier, and to communicate said entries to said means maintaining the node-specific data structure for said entries to be added to the node;
- said means for maintaining the node-specific data structure are adapted to detect an old distribution identifier not being anymore allocated to said node due to the reallocation, said old distribution identifier being a distribution identifier allocated to said node at the time of the reallocation, and to identify in the node-specific data structure the entries corresponding to said old distribution identifier, and to clear said entries from the node-specific data structure.

26. [currently amended] A computer-readable medium having stored thereon

2 computer-readable instructions which when executed by a computer control said computer to
3 perform the following steps: program comprising program code for performing all the steps of
4 Claim 1 when said program is run on a computer.

5 -maintaining in a first node a first, node-specific data structure comprising
6 entries representing state information needed for handling sets of data packets
7 handled in said first node.

8 - maintaining in said first node in addition to said node-specific data structure a
9 second, common data structure comprising at least entries representing state
10 information for data packets handled in at least one other node of said network element
11 cluster, the contents of said common data structure effectively differing from the
12 contents of said node-specific data structure and including copies of all state
13 information entries maintained in a node-specific data structure of said at least one
14 other node and needed for handling sets of data packets in said at least one other
15 node, said entries being maintained according to information on how different sets of
16 data packets are distributed among the nodes of the network element cluster.

17 - dynamically changing distribution of at least one set of data packets from said
18 at least one other node to said first node the network element cluster, and providing
19 said first node with respective changed distribution information.

20 - in response to said changed distribution information, selecting the state
21 information entries of said at least one re-distributed set of data packets from said
22 second common data structure and transferring them to said first node-specific data
23 structure of said first node.

1 27. [currently amended] A computer-readable medium having stored thereon
2 computer-readable instructions that can control a computer to carry out a process, said
3 instructions comprising: program product comprising program code means stored on a
4 computer readable medium for performing the method of Claim 1 when said program product is
5 run on a computer.

6 -means for maintaining in a first node a first, node-specific data structure
7 comprising entries representing state information needed for handling sets of data
8 packets handled in said first node.

9 - means for maintaining in said first node in addition to said node-specific data

structure a second, common data structure comprising at least entries representing state information for data packets handled in at least one other node of said network element cluster, the contents of said common data structure effectively differing from the contents of said node-specific data structure and including copies of all state information entries maintained in a node-specific data structure of said at least one other node and needed for handling sets of data packets in said at least one other node, said entries being maintained according to information on how different sets of data packets are distributed among the nodes of the network element cluster.

- means for dynamically changing distribution of at least one set of data packets from said at least one other node to said first node the network element cluster, and providing said first node with respective changed distribution information.

- means for responding to said changed distribution information, by selecting the state information entries of said at least one re-distributed set of data packets from said second common data structure and transferring them to said first node-specific data structure of said first node.